Appendix #15

B. Garder, "Using Property Taxes in Lieu of Direct User Fees to Pay for Water," Brigham Young University

Using Property Taxes in Lieu of Direct User Fees to Pay for Water

B. Delworth Gardner
Professor Emeritus of Economics
Brigham Young University

Introduction

The current drought in much of the Western United States has raised deep concerns as to whether water supplies will be adequate to meet increasing future demand, particularly by urban, industrial, and recreational users. Irrigated agriculture in Western States typically accounts for over 75 percent of consumptive water use, and demand from expanding urban areas has necessitated water transfers out of agriculture. The question is ubiquitous whether conservation can save enough water to maintain a viable agriculture and simultaneously meet the needs of a changing economy. Howitt (2002) has argued that the costs of institutional change in water tend to be high because the rents from water use and current property right allocations change as institutions change, and concerns for equity (income distribution) are often of dominating political importance.

The primary purpose of this paper is to explore some of the economic implications of using ad valorem taxes assessed on real property at the state or county level in lieu of direct user charges to pay for water development and allocation. Use of these taxes unrelated to the quantity of water demanded results in an implicit subsidy to water users, and special focus will be on the misallocation of resources that occurs when water is priced below its supply cost.

The geographical focus of the paper will be on Utah, the state that ranks second to Nevada in the per capita consumption of water and which also has some of the lowest water prices in the Western United States (Utah Foundation). In Utah, and other arid states, public water districts have been created by statute to manage water sales and distributions, and these districts have been given authority to levy property taxes in the state or in local jurisdictions to generate revenues needed to meet repayment obligations to large water developers such as the federal Bureau of Reclamation. If a district's goal is to maximize the quantity of water sold, a reasonable assumption for these non-profit public institutions, then any device such as a property tax that will reduce direct prices paid by final water users will help accomplish this goal (Miller).

Changing revenue sources for the public water districts, the major wholesalers of water, is seen as threatening their financial viability, and they naturally strongly oppose giving up the property tax. Hence, attention must be given to whether or not direct water charges as a substitute revenue source for the property tax are politically as well as economically feasible. The paper, therefore, will also address specific objections by the water districts and their supporters to replacing the property tax with direct user charges.

The paper will also discuss the water conservation implications of using direct charges in lieu of property taxes to pay for water. In general, water savings can be effectuated ed through government-mandated regulatory rules, such as limiting lawn irrigation to certain days or to specific times, or by final users themselves who may conserve water in numerous ways as they respond to higher water prices. I argue here that voluntary price-induced conservation will usually turn out to be far more flexible, wide-spread, durable, and effective than command-and-control government action which tends to be intrusive on freedom of choice. This is not to say that government has no role to play in conservation—educating water consumers about economically feasible conservation practices available may very useful.

How important are water-directed property taxes in Utah compared to other states in the Western region? The Utah Rivers Council (2002) conducted a study of water suppliers across the 11 contiguous Western States, 54 of them outside Utah and eight within the state. The study found that Utah water districts have statutory authority to levy <u>higher</u> property taxes than those in most other states. Moreover, a greater percentage of Utah districts actually utilize property taxes than in the other states, and these taxes are a higher percentage of total district revenues in Utah. Specifically, in the Western region outside of Utah, of the 12 districts in the sample that use property taxes, eight of them receive less than 16 percent of their total budget from these taxes. By contrast, in Utah, according to data assembled in the State Auditor's Office (2002), property taxes account for between 17 and 20 percent of total revenues in four of the Utah districts, and between 32 and 67 percent in the other four districts. Furthermore, of the 12 suppliers sampled outside of Utah that do collect property taxes, only three used the property tax revenues for general fund purposes (such as administrative, operation, and maintenance costs), whereas in Utah all of the responding districts (only four of eight districts responded to the River Council's survey) use funds for these general purposes. These findings are clear that Utah districts on average utilize the property tax to a much greater extent as a revenue source than do comparable districts in other Western states.

The Property Tax and Efficient Allocation of Water Resources

In a market economy prices serve as signals to both consumers and producers. Consider a hypothetical market for water. If available quantities of water to individual users are not restricted, rational consumers will extend the quantity of water consumption to the point where the benefit derived from the last unit of consumption is equal to the price paid. The demand showing the marginal values of alternative quantities of water consumed for a typical consumer is illustrated by the curve labeled D in Figure 1 below. The various points along the demand curve represent the marginal valuations by consumers of alternative levels of quantities of water consumed, and because of diminishing marginal utility these valuations fall as more water is consumed. An aggregate demand curve for water in a given market can be represented as the horizontal summation of water quantities demanded at various prices across all individual users.

Also, following traditional economic theory, the supply curve (S) represents the marginal opportunity costs of supplying various quantities of water to ultimate users. These costs will include construction as well as operating and maintenance costs. These costs are presumed to rise with increasing quantities of water supplied as scarce capital, labor, and management resources are pulled away from other alternative uses.

Only one water price will equate the marginal costs of supplying water (on the supply curve) with the marginal valuations of consumers (on the demand curve). Let us denote this price as p_o and its corresponding quantity demanded and supplied as $q_{o.}$ This point is the equilibrium price and quantity that represents an efficient allocation of resources in the water market. Let us see why.

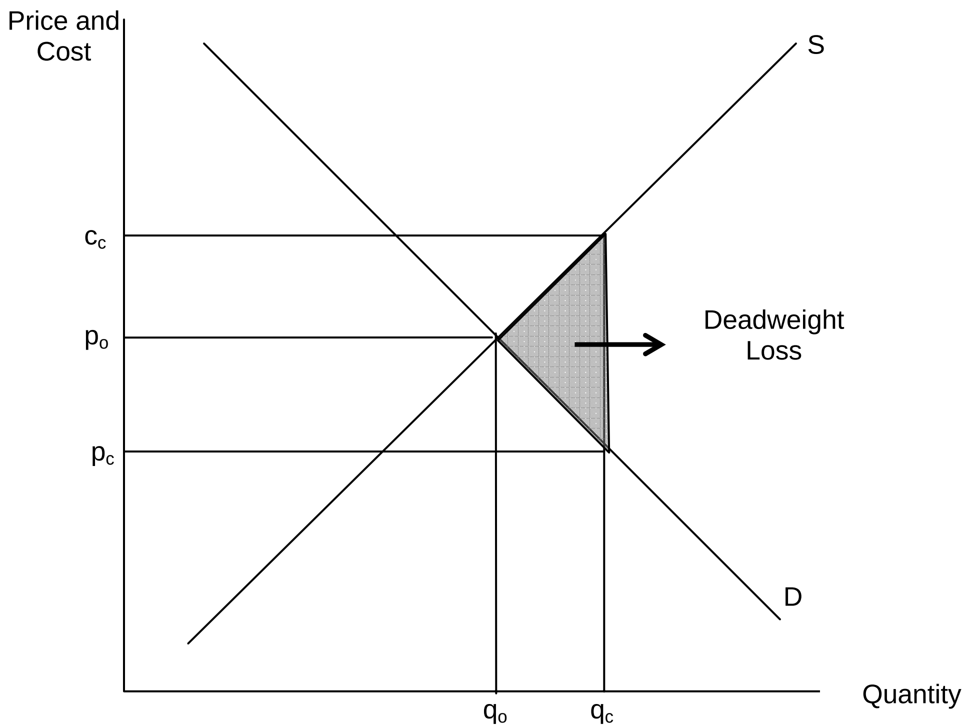

Figure 1. Inefficiency in a water market due to underpricing.

At any quantity lower that q_o the marginal valuation for consumers of water is higher than the marginal cost of suppliers and, therefore, increasing the quantity of water to q_o would produce a surplus of value over cost. At quantities higher than q_o the marginal valuation of consumers is lower than the marginal cost of water so quantities above q_o are more costly than they are worth. Too many resources have been allocated to supplying water to be efficient. It follows that at quantity q_o the allocation of resources is efficient since the marginal value of water to consumers is equal to the marginal cost of supplying it, and the market clears since the quantity demanded is equal to the quantity supplied.

Now, suppose that for one reason or another, the water price is not allowed to rise to the equilibrium price of $p_{o.}$ Using ad valorem property taxes in lieu of direct water user prices as a revenue-producing mechanism in a water district would be one such case. The market price, therefore, would cease to lead to an efficient allocation of resources to water development and use. In effect, taxes on real property owners can be regarded as a "subsidy" to water consumers since the assessed valuation of property for tax purposes is independent of water use. Hence, the tax has no direct role in determining how much water will be demanded.

In Figure 1, assume that the subsidized price allowed by the property tax is $p_{c.}$ The associated quantity demanded is q_c, a larger quantity than is the economically efficient quantity of q_o. Hence, at p_c excess demand exists, and consumers will inform water suppliers that they want more water at this price. The history of water development is replete with examples of positive responses to these "requests." This problem is especially acute in the case of public suppliers, since the *sine qua non* of politics is that politicians seek to deliver political favors requested by their constituents.

Note that the marginal cost of water at quantity q_c is $c_{c,}$ far above its value to consumers at $p_{c.}$ In fact, the shaded area in Figure 1 represents the difference between what the quantities between q_c and q_o are worth and what they cost and is referred to as "deadweight loss" by economists--a measure of economic inefficiency. Too many resources are being allocated to supplying water to be efficient since society values the "excess" resources to supply water more highly in other uses. So long as demand curves for water are negatively sloped and supply curves are positively sloped (a view held by virtually everybody), holding water prices to final users below equilibrium levels will produce deadweight losses. This is the irrefutable theoretical conclusion of using property taxes to substitute for direct water prices. Of course, the quantification of the precise amount of deadweight loss is an empirical matter and will depend on the slopes of the demand and supply curves for water that may vary by use, geographical area, and supply source. I have demonstrated elsewhere (Gardner 1995, Chapter 12) that water subsidies used on federal projects have produced inefficient and premature irrigation development in the Western United States.

A political implication of requiring users to pay the total supply cost of water is that they will only then support the construction of projects that are economically feasible—where expected project benefits exceed project costs. If all the costs were covered by revenues derived from direct water charges, and water users were contractually obligated to pay these costs with no chance of being bailed out if repayment problems occurred, then only economically feasible projects would be built. On the other hand, if the costs can be shifted to other parties, and the water is priced below its cost, then no such assurance exists that consumers would support only efficient projects. Hence, if part of the costs of water supply can be shifted from water users to owners of property via the property tax, water users may enthusiastically support water projects, even if the project costs exceed project benefits. Such inefficient projects diminish rather than enhance the wealth and average standard of living of society as a whole.

Another extremely important consequence of pricing water below its cost for a specific water project is that other potential supply sources may not be given adequate consideration in meeting demand. Water reclamation, secondary water systems, more intensive ground water utilization, water conservation, and shifting lower-valued water to higher-valued uses, are supply alternatives to new development projects by federal and state governments. It should be obvious that wealth is created most efficiently by utilizing water supply sources with the lowest costs.

Many objections to replacing property taxes with increased user fees are commonly given by those in the water supply business. Perhaps the most prominent is an allegation that if the price were raised, demand would not be sufficient to utilize all of the water supply available and this would waste water. Another is that the public water districts that supply water to final users might not raise sufficient revenues from user fees to meet their contractual obligations for federal water. Still another is that raising final user prices to replace property taxes would discourage water conservation by the water suppliers. There is also a fear that giving up property taxes as a revenue source would lower the bond ratings of water district debt and, therefore, cost the districts more to borrow money. And, finally, an objection to raising water prices is that this would impose inequitable costs on poor people. Let us investigate the validity of these allegations in turn.

Will Raising Rates Result in Wasted Water?

If it is in fact true that water supplies have been increased to eliminate excess demand at the controlled price, then it is apparent that if the price were raised, demand would be insufficient to utilize the available supply. In Figure 1, if quantity q_c of water is available for distribution, a final user price above p_c would produce excess supply. Unused water would run off into sinks such as the Great Salt Lake or would move into storage in reservoirs, lakes, and groundwater aquifers until they are filled to capacity. It is not entirely clear, however, that this water would be wasted, especially over the long term. Stored water may be valuable as insurance in times of drought and inadequate run-off, and some environmental and recreational benefits could accrue from greater quantities of water in storage. However, the point must be granted that in an average year, to say nothing of years of plentiful supply, it is possible that lower quantities demanded at higher water prices may result in surplus water. A complicating factor is the dynamics of a growing economy. For example, the Wasatch Front of Utah is a rapidly growing urban area, both in population and economic activity. Household demand is affected by income—as per capita income rises, the demand for water rises. In fact, it is roughly true that if price were held constant, the demand for water would increase at a rate almost proportionate to increases in per capita income and population. The implication is that if the final user price were raised at about the same rate as increases in population and per capita income combined, little excess supply and wastage of water would occur. What is indubitably clear is that increasing water prices would obviate much of the need to develop increasingly costly new supplies.

Because some water supplies are stochastic, depending on precipitation and temperature, another pricing issue becomes relevant. If water storage facilities are not available to stabilize water supplies through time, an efficient pricing system should incorporate changing water prices as available supplies vary. Prices would be raised in years and seasons of short supply and lowered in years and seasons of plentiful supply in order to equate quantity demanded and quantity supplied. Of course, some agency would have to be responsible for gauging supply and demand and deciding on efficient prices. An objection might be raised that governments have little incentive to manage such a system of efficient water prices in the interests of all the people even if they have to capacity to do so. This point has merit, but the problem can be mitigated as long as the rate schedule was promulgated publicly in advance and became difficult to change without public approval.

Elasticity of Demand, Conservation, and Increases in Water Rates

The critical parameter affecting revenues from direct water prices, as well as conservation of water by final users, is price elasticity of demand for water. Price elasticity determines how much water demanded would be expected to fall as price increases. Formally, price elasticity is the percentage change in quantity demanded that accompanies a percentage change in the price. For example, if the price is raised by 10 percent and, as a consequence, the quantity demanded falls by 5 percent, the price elasticity of demand is –0.5; i.e., the percentage change in the quantity demanded is half as great as the percentage change in the price.

Given what economists know empirically about price elasticity of demand, it is perplexing why water prices are so often ignored in water planning to provide the "needed" supply. The typical plan projects changes in income and population, and these changes are then used to estimate changes in water "need." This neglect of price in planning implies that the demand for water is perfectly price inelastic (an elasticity coefficient of 0), meaning that the quantity demanded is completely insensitive to the water price. This implication is dead wrong and can lead to costly errors in anticipating how much water will be demanded when new water is available and some price is established to help cover supply costs.

What factors influence the price elasticity of demand for water, and what are the numerical estimates from empirical studies? The responsiveness of quantity demanded to changes in the water price depends on the number and magnitude of the adjustments that users will make to changes in prices. These adjustments are crucially important to what is known as "conservation."

Consider domestic or household use, which will generally include water used outside the home in lawns and flower gardens as well as inside the house in bathrooms, kitchens, and inside plant watering. Clearly, adjustments made in water use in response to a price change will depend on the time interval over which adjustments can be made. Economists refer to the period of adjustment as “runs,” i.e., short run, medium run, and long run. If the period is very short (say a day or even a week), the adjustment response to a price increase will probably be limited to something as simple as turning off the water tap sooner in the shower or reducing the time the lawn sprinkler is on. These limited adjustments imply that the price elasticity of demand in the shortest of runs will be “low,” i.e., perhaps –0.1. Over the longer run, however, additional quantity adjustments to a price change will be made—plumbing leaks can be repaired, water-using fixtures and appliances in the household can be chosen to use less water, and an irrigation technology in the yard can be selected to use less water. For example, drip systems (that deliver a very high percentage of water to the root zone of the plant) can be used instead of sprinkling technology that may involve greater water losses to evaporation and percolation below the root zone. Even the plants in and outside the house might be changed to those that require less water, or perhaps landscaping could be used that has no plants at all. It is striking how different landscaping is among communities that face sharply different water prices: for example, Salt Lake City, Utah (with very low water prices) and Tucson, Arizona (with high prices). In the long run, when all economically feasible adjustments are made, the price elasticity of demand will be high (-1.0, or even higher).

In irrigated agriculture also farmers can make a great number of possible adjustments in responding to changes in water price: in cropping patterns, irrigation technologies, irrigation practices, ditch and canal linings, and recovery of tailwater (Gardner, 1983). Considering all of these adjustment possibilities, it should be no surprise that price elasticity of demand for water is much higher (more elastic) than is commonly assumed.

What do empirical studies indicate about the price elasticity of demand for water? First, a caveat must be noted. The results of empirical studies might well be biased downward (too low) as a reflection of the “true” long-run elasticity of demand. The observed water users, on which the calculation of elasticity is based, may not have completed all of the adjustments they intend to make at the time their use rates are observed.

Empirical studies are of two types: time series and cross-sectional, or perhaps a combination of both. In the time-series analysis, the water use-rates of the same consuming units (say households or farms) are observed at various points in time as they face different real water prices. In cross-sectional studies, different consuming units facing different water prices are observed at the same time period. In both cases, the basic units of observation are users consuming different quantities of water at different prices. Statistical (usually regression) techniques are then utilized to estimate the coefficients of price elasticity of demand. Because the data on prices and quantities are more easily available for the same users through time, time-series studies of elasticity are more common than cross-sectional studies.

A priori, however, a higher price elasticity of demand (more elastic) is expected in cross-sectional than in time-series analyses. Why? Price variation among different units of observation (communities) at a given moment in time is normally quite large in cross-sectional analyses. As discussed above, consumers of water have a relatively long period to make quantity adjustments in response to these differences in price and this greater variation will show up in the observed data. On the other hand, in typical time-series analyses, the relative prices of water (the nominal price corrected for inflation) may change little from one year to the next. Hence, the annual adjustments in observed quantity demanded to a short-term price change may be far from complete when the annual price is changed again and a new quantity demanded is observed. This means that the quantity adjustments observed may be far from being completed, and hence, less variation in the quantities demanded will be observed. This implies that lower estimates of elasticity of demand (more inelastic) will be calculated. This is really the same point that has been made above that short-run elasticities are less elastic than long-run elasticities.

A graduate student and I did a cross-sectional study of household water use in 44 Northern Utah communities in the early 1960s (Gardner and Schick, 1964). Water prices and average household consumption, along with several other variables such as the average lot size and the average value of the community's houses, were collected. A large amount of variation among these communities in water prices and quantities was observed, and the estimated price elasticity of demand was –0.77.

Dr. Gail Blattenberger, Professor of Economics at the University of Utah, has collected price elasticities of demand for water from about 50 studies from the Western

United States, excluding Utah, and eight additional ones from Utah.[1] Some variation in elasticity estimates exists, but nearly all of them are between 0 and -1, meaning they also are relatively inelastic.[2] Blattenberger's data suggest that the range of elasticity estimates for Utah are very similar to those for the Western United States excluding Utah, and that -0.5 would be a fairly representative number for both areas.

What are the implications of these price elasticities for water conservation? Conservation may occur at many levels in the supply chain, but primarily at the water district level and at the final user level. The water districts sometimes are required to implement government-imposed conservation practices, and the districts often supplement these requirements in order to increase the usable water supply available to their customers (Thompson 1993).

The districts argue that replacing the property tax with higher direct water prices would reduce their revenues and hence their ability to promote conservation. Also, since a smaller water quantity would be demanded at the higher price less need for district conservation would exist. These arguments seem questionable for two reasons. First, higher prices as a substitute for property taxes may be set at levels that would be revenue neutral for the districts. But, more importantly, the higher prices would result in less water demanded primarily because users themselves would have an incentive to conserve, making conservation at the district level less urgent. Of course, elasticity of demand is the critical determinant of how much water market revenues would decline if

. [1] Professor Blattenberger also has collected elasticity estimates from the Eastern United States and a few foreign countries, but these appear less applicable to Utah than those from other states in the arid West.

[2] An exception is an elasticity estimate for water consumption of -1.57 to -1.63 made by Hewitt and Hanemann (2000), who employed a discrete/continuous choice model rather than standard regression analysis to estimate price elasticities. Their works shows that the choice of analytic method may also be an important determinant of elasticity.

higher prices were imposed as well as how much final users would conserve on water use.

The relationship between price and conservation merits more discussion, especially in times of drought. As argued above, if the quantity demanded falls because of a price increase, it is principally because water users are adjusting to the higher price. This is water conservation that is likely to be the most ubiquitous as well as most effective. The water districts are limited in their capacity to save water anyway. They may mandate practices such as requiring water-saving shower heads, more water-efficient toilets, smaller lots, or any number of other practices, but as they face higher prices, final users will have the incentive to look at these and countless other ways to conserve water without being required to by anybody. That the districts are worried about smaller water quantities demanded is proof that voluntary water conservation by the final users is effective. The conclusion must be that the practice of using property taxes in lieu of water tariffs is clearly anti-conservation as has been noted by Thompson, Jr. (1993: 23).

Meeting the Water District's Financial Obligations

Another issue is of understandable concern to the water districts is meeting their repayment obligations to the developers of water, especially the federal government that distributes water to the districts from large reclamation projects. After all, this was a principal reason the districts were created in the first place. I believe that this worry is overestimated and overstated. Another important implication of elasticity studies is that if water demand is price inelastic, which it is, then direct water sales at higher prices will generate more market revenues. Price inelastic demand means that the quantity reduction resulting from a price increase is proportionately less than the price rise so revenue (price times quantity) increases. But whether or not the increased market revenues from price increases will be enough to compensate for the loss of property taxes depends on the amount of the price increase, the price elasticity of demand, and the proportion of total district revenues that are derived from property taxes.

Some illustrative numbers will clarify the relationship between elasticity of demand and market revenues. Assume initially that property tax revenues provide one-quarter of total district revenues and that market sales of water provide the other three-quarters. Suppose that:

Property tax revenue = $25 million

Revenue from water sales = $75 million

Total revenue = $100 million

Also, assume that the water price is $2 per unit of water (say 10,000 gallons) and that quantity demanded at that price is 37.5 million units.

The question is how high would the water price have to be if market revenues from sales were to replace the property tax and generate total revenues of $100 million, assuming that price elasticity of demand is –0.33? If the price were increased 100 percent (doubled) to $4, quantity demanded would fall by 33.33% or to 25 million units. Total revenue would be $4 x 25 million or $100 million and revenues from increasing the price would just offset the lost revenues from the property tax.

Of course, the more inelastic the demand for water, the higher would be the market revenues generated by a given price increase. For example, if the price elasticity of demand were –0.77 (much less inelastic than –0.33), then the price would have to be much higher to offset the revenues lost from property taxes because the response in quantity demanded would be much greater. If the proportion of total revenues provided by the property tax were smaller, then given the elasticity of demand, the smaller would be the necessary rise in the water price to be revenue neutral.

Consider an alternative set of assumed data:

Property tax revenues = $10 million

Revenues from water sales = $90 million

Total revenues = $100 million

Water price is $2 per unit and quantity demanded is 45 million units

Price elasticity of demand is assumed to be –0.5.

The question is what market price would generate revenues of $100 million and thus be revenue neutral? If the price were raised by 33.33 percent to $2.67 per unit, the quantity demanded would fall by 16.5 percent to 37.375 million units. Total market revenues would be approximately $100 million. Comparing the numbers in the two illustrative examples presented, it follows that other things being equal:

(1) the lower the dependence on the property tax in raising revenue, the smaller the price increase needed to replace the property tax and be revenue neutral.

(2) the less inelastic (more elastic) the price elasticity of demand for water, the greater the conservation (quantity) response to a price change will be needed to be revenue neutral.

Contractual Obligations to the Bureau of Reclamation

Personnel from the public water districts argue that they are obligated by contract to use property taxes to raise revenues to pay the federal government for water supplied by federal projects, and hence it is moot to consider raising water prices in lieu of property taxes. Several of the Repayment Contracts between the federal government and the water conservancy districts in Utah were examined, including those for (1) the Uintah Water Conservancy District receiving water from the Vernal Unit of the Central Utah Project, (2) the Emery Water Conservancy District for water supplied by the Emery County Project, a participating project of Colorado River Storage Project, (3) the Central Utah Water Conservancy District receiving water from the Bonneville Unit of the Central Utah Project, and (4) the Weber Basin Water Conservancy District, receiving water from the Weber Basin Project. The boilerplate stating the terms of these contracts is similar in all four. The Central Utah Water Conservancy District repayment contract will be examined here as illustrative.

"The District agrees to pay the United States the project repayment obligation of not to exceed $130,673,000 divided into (1) an irrigation repayment obligation of $16,400,000, (2) an ad valorem tax revenue obligation of not less than $38,005,000, and (3) a municipal and industrial obligation of $76,268,000 plus interest, the sum of not less than $47,000,000 shall be collected and paid from ad valorem taxes. . . .The District agrees to levy and collect ad valorem taxes as may be necessary to meet its obligations to the United States. . . .These collections and payments shall be required until the project repayment obligation is paid in full. Revenues from one-half mill levied and collected by the District under Section 73-9-16 of the Utah Code, and, as required, the revenues from one-half mill now authorized by Section 73-9-20, or the revenues from one-half mill levied and collected under said sections based on a projected increase in assessed valuation of property within the District of two and one-half percent per year compounded, commencing in the year of 1965, whichever amount is less, are hereby specifically pledged as security to repay the District's repayment obligation."

A 1985 Supplemental Contract is also relevant to the property tax issue. "It is mutually agreed that the language in Paragraph 6(d) of the 1965 Repayment Contract regarding the minimum amounts and limitations on the ad valorem tax pledge is hereby superceded and the one-half mill pledge shall be based upon the actual assessed valuation of property within the Central Utah Water Conservancy District; Provided, however, that such pledge will not exceed the then current annual payment. This pledge includes the tax revenues necessary to pay $38,005,000 and $47,000,000 municipal and industrial cost obligation as specified in Article 6 (a) of the 1965 Repayment Contract." The effect of the supplemental contract is that since the property values within the district boundaries were increasing at a higher rate than was assumed when the original contract was signed, the supplement provided that the one-half mill levy would apply to the higher valuations.

The contract between the United States and the Weber Basin Water Conservancy District specifies that: "b. Nothing in the contract shall be construed to deny: (4) the United States a prior claim to all or such part of the proceeds of the ad valorem tax of one mill permitted to be levied under the authority of Section 100-11-16, Utah Code, as amended, as may be necessary in each year to assure the prompt payment of the amount due the United States hereunder in such year, and such prior claim is hereby expressly recognized by the District, but if under any law now or hereafter available the District shall in any year impose an ad valorem tax in excess of one mill on the dollar, the proceeds of such additional tax may be used by the District for mentioned bonds or other securities, free of any claim thereto by the United States." In effect, the agreement states that tax revenues in excess of funds needed for repayment of the federal obligation can be used for the district's other purposes.

Actually, when the project costs turned out to be higher than originally anticipated, the contract was amended so that the District could reimburse the United States for a greater amount. An amended contract in 1961 states that "one-half of the mill levy could be used to generate revenues to repay the United States, and the other one-half shall be available for application on District bonds."

Hence, it is quite explicit in these contracts that a property tax would be levied and used to repay the United States for water deliveries. The financial obligations of the water districts, however, may be greater than the contractual obligations to the federal government, and the districts may borrow to cover these obligations as well and use the property tax as a device to redeem this indebtedness. Therefore, the use of the property tax as a means of raising district revenues cannot be attributed entirely to the contractual obligations to the federal treasury.

Another issue arises in the event that federal water is transferred from irrigation to industrial and municipal uses. The repayment charges must be increased to reflect the fact that irrigation use is subsidized, and irrigators pay a smaller charge per acre-foot of water than do industrial and municipal users. These repayment changes are covered in official "block notices" given by the United States Department of Interior to the relevant water district. For example, a notice dated December 24, 1968, changed the repayment obligation of the Weber Basin Conservancy District when a block of 5,000 acre-feet of irrigation water was transferred to municipal and industrial uses. The block notice specifies how the increased repayment obligation is to be distributed among the repayment categories, and in this particular case, an ad valorem tax was assessed that covered about 12 percent of the additional repayment obligation.

These contracts, amended contracts, and block notices, therefore, clearly indicate that the United States has built an ad valorem property tax into its contractual repayment agreements with the water districts in Utah. If direct water prices were to replace revenues derived from property taxes the United States Government would need to give its approval by amending its contracts with the districts until repayment has been made in full, at which time the districts would appear to be free to raise revenues in whatever manner they wish.

Now the federal government may have some reluctance to agree to a change in repayment contracts, especially if the financial positions of the districts were weak and there is risk that they may default on their repayment obligations. Given that the districts have been using sinking funds to acquire financial reserves to cover repayment contingencies, however, and the value of water is increasing through time, the districts seem to be financially healthy. It would appear that they could use direct water prices to raise the required revenues if they had the will to do so, and the federal government might agree if asked to do so. But why should the districts do so on their own volition? It would not appear to serve their interests to give up a secure source of property-tax revenues without some requisite political intervention.

Bond Ratings and Debt Management

Another concern of the districts is that revenues from the property tax are necessary to maintain the favorable ratings on bonds they issue for water planning and development and other purposes. Bond-rating agencies such as Standard and Poors, Moody's Investor Services, and the Fitch Rating Agency use a variety of factors in rating the debt of states and their public districts. These include whether the debt is insured, the quality of management services, anticipation of future regulatory or growth restrictions, and the reliability of implementing rate increases or other revenue sources to cover operational or capital costs. The question at issue here is whether collecting property taxes systematically improves bond ratings for those districts that use them?

The Utah Rivers Council (2002) survey referred to above queried water suppliers about the bond ratings for issued district debt. For the 42 agencies sampled outside Utah not utilizing property taxes, eight issued no bonds, while 34 districts reported a total of 57 issues with ratings. Of these, nine (15.8 percent) had the highest grade, 32 (56.1 percent) had a high grade rating, and 16 (28.1 percent) reported an upper medium rating. As expected, those bonds that were insured generally received the highest rating. All of the ratings ranging from highest to upper medium, however, are considered to be "quality investment" grade, meaning that the debt is considered low risk. It is obvious that levying a property tax was not a requirement to receive a "quality investment" grade.

For the 12 outside-Utah agencies collecting property taxes, 18 ratings were reported. Of these, 6 (33.3 percent) reported having the highest grade, 8 (44.4 percent) received a high grade rating, 3 (16.7 percent) received an upper medium grade rating, and 1 (5.6 percent) received a medium grade rating.

In Utah, half of the ratings were obtained directly from the water conservancy districts (only half responded to the survey) while the rest were acquired from Moody's Investor Services. The 8 districts reported 8 bond issues, but one was an unrated State of

Utah loan. Of the remaining 7, 2 (28.6 percent) received the highest grade rating, 4 (57.1 percent) had a high grade rating, and 1 (14.3 percent) had an upper medium grade rating.

For those districts outside Utah not using property taxes as a revenue source, 71.9 percent had ratings in the top two categories of highest grade and high grade. Those districts using the property tax had 77.7 percent in these two categories, while in Utah those using the property tax (all of them) had 85.7 percent in highest grade and high grade. Comparing all of these numbers, the conclusion is that those districts which collect property taxes have a slightly higher average bond rating (and therefore lower interest rates), but the differences are surprisingly small. Given the other factors that also affect the ratings, this evidence is by no means conclusive that the ability to collect property taxes will reduce the interest rate paid on district indebtedness. A district always has the option of insuring its bonds to increase its rating whether or not a property tax is levied. Of course, insurance is costly, so it may or may not be financially feasible to insure.

For many decades, the State of Utah has acquired very favorable ratings on its debt for which it is justly proud, and this reputation for financial rectitude might have spilled over to its water districts. What seems to be clear from the data presented above, however, is that there is no systematic tendency for the rating agencies always to favor those which use property taxes to collect revenues.

Full-Cost Water Pricing and the Poor

A concern that surfaces whenever proposals are made to increase utility prices is whether "poor" people can afford to pay them. In the context of this paper, will the replacement of property tax revenues to the districts by an equal revenue increase produced by direct water charges result in a more unequal distribution of income among the district's customers? Two observations seem especially relevant.

First, it is by no means obvious, *a priori*, that the distribution of direct water charges from metered use would fall disproportionately more on low-income people than would the property tax. People at the lower end of the income distribution also own property (especially homes) that is taxed to raise revenues for the districts. Moreover, it is true that people at the high end of the income-distribution ladder would pay more for direct water charges than their low-income counterparts, since they have larger homes and more spacious grounds that use water. They also own more water-using businesses, and belong to golf clubs and other recreational facilities more than low-income people do. Unfortunately, I know of no empirical studies that would shed light on these income-distribution questions, and such studies are needed.

A second point is that, in general, using price concessions on specific commodities such as electricity or water to effectuate more equality in the distribution of income is highly inefficient because of the resource allocation effects discussed earlier. Much more efficient policy alternatives are available for such tasks, such as direct income support to the poor incorporated in lower income tax rates for the poor and welfare programs.

Conclusions

Preserving the property tax as a method for producing revenues for the public water districts in Utah is highly questionable on both theoretical and pragmatic grounds, especially for new water districts not yet created. Failing to price water at market-clearing levels has produced inefficient water development and allocation and has resulted in vast overuse in periods of water shortages such as the drought currently existing in the state. Instead of resorting to very costly new development of water supplies to meet excess demand resulting from “underpricing,” the people of the state would be far better served by pricing water at true supply costs.

It appears that the water districts could survive and even thrive by relying on increasing direct charges on water users. It may be true that those districts that have relied most on property taxes, and have therefore produced the greatest distortions between consumer valuations and water supply costs, would need to raise prices by a considerable amount to replace the lost revenue, but doing so would induce sharp increases in water-use efficiency through voluntary conservation. These conservation effects would be strongly salutary in precluding the necessity of relying on costly development of new water to meet increasing demands from domestic, industrial, and recreational users. The only important constraint on the districts should be that water prices should not be raised so much that available supplies would go unused, unless this unused water would move into sinks where it could be stored and used at a later time.

It appears that contracts between the districts and the federal Bureau of Reclamation would need to be renegotiated in order to eliminate the property tax, but it is difficult to understand why the federal government would not be interested in increasing water conservation as long as the Treasury is fully repaid. The water districts seem to be fully capable of managing their debt and repayment obligations without the property tax, protestations notwithstanding. The argument that they need the tax to retain their financial ratings in order to acquire debt at favorable interest rates seems questionable at best. If the argument were valid, how is it that water districts without the power to tax have the ability to secure debt at almost equally favorable rates?

The only critical issue is the timing of replacing the property tax with higher user charges. The water problem in Utah is not that existing supplies are inadequate to meet increasing future demands—the problem is that water is not priced at the level required to cover supply costs and equate supply and demand. The question of an optimal pricing policy as between fixed user charges and a levy on metered quantities utilized is complex (Griffen 2001) and will not be discussed further here, except to say that many pricing alternatives are available to serve a variety of local circumstances.

As to the question of the timing of the price increases, a prudent policy would be to increase the price at approximately the rate of increases in demand in order to prevent current supplies from being unused. After all, the costs of existing supplies are largely sunk costs that have already been expended and are therefore irrelevant to efficient development. Hence, for existing developed water, a gradual shift to direct water charges is probably most feasible. But a requirement should be imposed that the water users that benefit from new development must contract to pay the full costs, and this requirement should apply to irrigators as well as other user types. And there must be no reneging on the contracts later in the game. Only by requiring that the beneficiaries pay the full cost can uneconomic new water projects be prevented. For too long, water projects have been subsidized by separating water prices from supply costs, thus leading to premature and uneconomic water projects.

References

Gardner, B. Delworth, (1983) “Water Pricing and Rent Seeking in California Agriculture,” Chapter 3 in *Water Rights,* edited by Terry L. Anderson, Pacific Institute for Public Policy Research, San Francisco: 83-112.

Gardner, B. Delworth and Seth Schick *(1964). Factors Affecting Household Water Consumption in Northern Utah,* Utah Agricultural Experiment Station Bulletin 449, Utah State University, Logan: 1-25.

Gardner, B. Delworth (1995). *Plowing Ground in Washington: The Political Economy of U.S. Agriculture,* Pacific Research Institute for Public Policy (San Francisco).

Griffen, Ronald C. (2001). “Effective Water Pricing,” *Journal of the American Water Resources Association,* 37 (5), October, 2001: 1335-1347.

Hewitt, Julie A. and W. Michael Hanemann, “A Discrete/Continuous Choice Approach to Residential Water Demand under Block Rate Pricing,” Land Economics May 1995 Volume 71 No. 2, pg. 173-192.

Howitt, Richard E. “Drought, Strife, and Institutional Change,” *Western Economics Forum,”* Fall, 2002, 1 (2): 11-14.

Miller, Jon R. (1993). “On the Economics of Western Local Water Finance: the Central Utah Experience,” *Land Economics,* 69 (3): 299-303.

Utah Foundation, “Creating an Oasis: Part Two: Water Consumption, Pricing and Conservation in Utah,” *Research Report,* Report Number 650, April, 2002.

Thompson, Jr., Barton H. “Institutional Perspectives on Water Policy and Market,” *California Law Review,* May, 1993: 81 Calif. L. Rev. 673: 1-111.

Utah Rivers Council (2002). *Mirage in the Desert: Property Tax Subsidies for Water*.

Utah State Auditor’s Office, *Survey of Local Government Finances Summary Data,* (various years, 1992-2000).